4.0 ENVIRONMENTAL CONSEQUENCES

The Proposed Action has two components, the power plant and the direct-use application. The impacts of implementing both components are discussed first for each environmental resource. Then the environmental impacts for implementing either component alone are discussed. Either component implemented alone would involve; the drilling of a new freshwater well, construction of a new freshwater pipeline, drilling a reinjection well, construction of a pipeline from the AmeriCulture site to the reinjection well, and removal of the existing heat exchanger and installation of a downhole pump in the AmeriCulture State 1 well. Therefore, the impacts from these actions are common to implementing both components together or implementing either component alone.

4.1 GEOLOGY AND SOILS

4.1.1 Proposed Action

Soils. The Proposed Action includes several activities that would result in the disturbance of 9.3 acres (3.8 ha) of land. The drilling of a new freshwater supply well, the construction of a second freshwater pipeline, the construction of the proposed power plant, the drilling of an injection well, and the construction of a new pipeline from the site to the injection well would all involve land disturbance.

The drilling of the new freshwater well would take place adjacent to the existing freshwater well. Approximately 1 acre (0.4 ha) of the area around the existing freshwater well was disturbed when the original well was drilled and has continued to be disturbed over the years from maintenance activities (see Figure 2-3). The well site covers an area of approximately 2 acres (0.8 ha), with a gated road and a water tank. Approximately 8,650 ft (2,640 m) of new freshwater pipeline would be buried alongside the existing freshwater pipeline. The approximately 5 acres (2 ha) of land that would be disturbed by trenching and other actions during the construction of the new pipeline was previously disturbed by the construction of the old pipeline, vehicle use, and powerline and fence installation. Therefore, the drilling of the new freshwater well and the construction of the new freshwater pipeline would not require the disturbance of additional land.

The proposed power plant and cooling towers would be located in an area that has been previously disturbed over time by the operations of AmeriCulture and the previous owner. The construction of the power plant and cooling towers would only involve the disturbance of 0.6 acres (approximately 0.2 ha) of disturbed land.

The drilling of the new injection well would disturb up to 1 acre (0.4 ha) of land around the new well site. The new pipeline from the proposed project to the new injection well is approximately 3,000 ft (approximately 900 m) long. With a conservative estimate of a 25-ft (7.6-m) wide area of disturbance along the pipeline, an area of approximately 1.7 acres (0.69 ha) of land would be disturbed. The land where the proposed injection well and pipeline would be constructed has only been disturbed to date by grazing activities and some vehicle use.

Implementing the proposed power plant component without the direct-use application component would result in disturbance of 9.3 acres (3.8 ha) of land as discussed above for implementing both components.

Implementing just the direct-use application would result in disturbance of 8.7 acres (3.2 ha) of land as discussed above for implementing both components. The 0.6 acres (approximately 0.2 ha) of previously disturbed land where the proposed power plant would have been located would not be disturbed for the direct-use application.

Geothermal Resources. As stated in Section 2.3, the Proposed Action would involve pumping hot (approximately 232°F [111°C]) water from the subsurface geothermal resource located at the AmeriCulture facility. This would require drawing approximately 1,000 to 1,200 gpm (approximately 3,800 to 4,500 lpm) of geothermal fluid from the AmeriCulture State 1 well.

As stated in Chapter 3, the total heat content of the Lightning Dock KGRA has been estimated at 2.1×10^{17} joules (Callender 1985). To assess the effect on the KGRA as a whole, it is necessary to compare the heat required to generate 1 MWe and compare it to the total heat content of the shallow reservoir.

The proposed power plant would use enough heat (13.7 MWt) to generate 1,280 kW gross electrical power per year (Exergy 2001). A watt is a unit of measure that is equal to 1 joule per second (J/s). The number of joules equivalent to 13.7 MWt is 4.32×10^{14} J/yr. This represents only a very small fraction (approximately 0.2 percent) of the 2.1×10^{17} joule heat content estimated in Callender 1985. Therefore, it appears unlikely that the proposed withdrawal of geothermal waters at the AmeriCulture location would adversely affect the resource as a whole.

The capability of a "wet" geothermal resource is dependent upon its ability to deliver geothermally-heated water stored in the underlying formations to a well for extraction. Accordingly, pump tests and calculations, discussed in Section 3.1.2, were performed to assess whether the pumping that would be conducted under the Proposed Action could be expected to compromise the geothermally-heated aquifer's ability to deliver water to the proposed well and wells currently operating in the vicinity.

Section 3.1.2 provides an overview of the methods used to define the characteristics of the heated water aquifer that make up the geothermal resource to be utilized under the Proposed Action. Water temperature was found to be approximately 111°C (232°F), and transmissivity and storativity were estimated at 62,393 gpd/ft (775,309 lpd/m) and 1.17×10^{-4} (dimensionless), respectively (Witcher 2001).

The Theis Method was used to calculate potential long-term drawdowns resulting from continuous pumping of 1,200 gpm (4,500 lpm) at the AmeriCulture State 1 well for 20 years. No other production or injection wells were included in these calculations. The drawdown at the well was calculated to be approximately 60 ft (18 m) after 20 years of continuous pumping. Drawdowns at various distances from the pumped well after 20 years (Witcher 2001) are summarized in Table 4-1.

Table 4-1. Theis Method Drawdown Predictions Resulting from the Proposed Action

	Drawdown - ft (m)				
Distance	50 ft (15.2 m)	100 ft (30.5 m)	500 ft (152 m)	1,000 ft (305 m)	2,000 ft (610 m)
1 year	31.2 ft (9.51 m)	28.6 ft (8.72 m)	22.7 ft (6.92 m)	20.2 ft (6.16 m)	17.6 ft (5.36 m)
5 years	34.1 ft (10.4 m)	31.6 ft (9.63 m)	25.7 ft (7.83 m)	23.1 ft (7.04 m)	20.6 ft (6.28 m)
10 years	35.4 ft (10.8 m)	32.8 ft (10 m)	26.9 ft (8.2 m)	24.4 ft (7.44 m)	21.8 ft (6.64 m)
15 years	36.1 ft (11 m)	33.6 ft (10.2 m)	27.7 ft (8.44 m)	25.1 ft (7.65 m)	22.6 ft (6.89 m)
20 years	36.7 ft (11.2 m)	34.5 ft (10.5 m)	28.2 ft (8.6 m)	25.7 ft (7.83 m)	23.1 ft (7.04 m)

Calculations were also performed indicating that continuous pumping of Burgett "B" State well at 1,000 gpm (approximately 4,000 lpm) for 20 years could result in an additional 30 ft (approximately 9 m) drawdown at the AmeriCulture State 1 well. The construction of the AmeriCulture State 1 well is adequate to tolerate the additional drawdown. Similarly, the construction of the existing nearby production wells in the Lightning Dock KGRA appear adequate to tolerate the drawdowns that would result from withdrawal of geothermal waters at AmeriCulture. Therefore, it appears that the portion of the Lightning Dock KGRA in the vicinity of the AmeriCulture facility would likely be able to supply power to the AmeriCulture facility without substantially degrading the capacity of the resource in the long term.

As discussed in Section 2.3.2, cooling tower blowdown water would be mixed with the spent geothermal water and reinjected into the geothermal aquifer approximately 3,440 ft (1,050 m) north-northwest of the AmeriCulture State 1 well, where the groundwater temperature would match that of the 140°F (60°C) geothermal water/blowdown water mixture. The approximate well position was selected to avoid thermal breakthrough at any of the existing wells in the area.

Chemical additives to the cooling water would be minimal due to expected low corrosion, low bio-fouling, and low scaling potentials. This is due to the low average temperature of the water at this site, the near neutral pH level of the water, and the use of stainless steel plates in the condenser. Mixing cooling tower blowdown water with spent geothermal water is a typical design for geothermal power plants utilizing cooling towers. The cooling tower chemical treatment program would be developed and monitored by a specialty company. The treatment program would be custom tailored and adjusted, as required, for the specific conditions at the site. These programs are designed to protect the cooling tower and water system, and to meet all environmental regulations. Impacts to the temperature and quality of the water in the Lightning Dock KGRA resulting from injection are therefore anticipated to be negligible.

Implementing the proposed power plant component without the direct-use application component would result in the withdrawal of the same amount of heat and geothermal fluid as discussed above for implementing both components. Impacts to the temperature and quality of the water in the Lightning Dock KGRA resulting from injection are therefore anticipated to be negligible.

Implementing just the direct-use application would result in the withdrawal of less geothermal fluid than discussed above for implementing both components. The amount of geothermal water used would be dependent upon the future size of the operation, which has not been projected; however, it appears likely that future withdrawals would be less than or equal to those that would occur if the power plant were constructed. Therefore, the impact of implementing only the direct-use application component would be similar to that which would occur for the power plant component, and are anticipated to be negligible.

4.1.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. The disturbance of approximately 9.3 acres (3.8 ha) of previously disturbed land associated with the Proposed Action would not occur. There would be no changes anticipated and therefore no potential for impacts to the geology and soils.

Hatchery activities would be expected to continue as they do presently. The use of the geothermal resource would remain the same. AmeriCulture would continue to use the downhole heat exchanger. There would be no additional impacts to the geothermal resource.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. Future facility expansion could occur with the potential for impacts to geology and soils. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.2 WATER RESOURCES

4.2.1 Proposed Action

Surface Hydrology. The existing surface water hydrology at the site consists of mainly sheetwash (in a generally east-to-west direction) and man-made drainage ditches. The new freshwater well and new freshwater pipeline would be constructed alongside of the existing well and pipeline. The drainage patterns would not be changed from their current configuration. The proposed power plant and cooling tower would be constructed in a flat, previously disturbed area. The new pipeline to the new injection well would cross over the shallow dry wash to the north of the project site. The injection water pipeline would be built on blocks or post to allow for thermal expansion and contraction of the pipe. Therefore, no trenching would be required. Some vehicle crossing of the dry wash would occur during construction. After construction, maintenance activities could also require some vehicle crossing of the wash. Since the area is so flat and the wash becomes indistinguishable from sheetflow features just to the west, the small amount of temporary effects to the wash during vehicle crossings would be minor.

The containment pond west of the greenhouse would be unaffected by the Proposed Action. The path of the freshwater pipeline does not cross the containment pond and the Proposed Action

would not increase or decrease the amount of water pumped to the containment pond from the hatchery tanks.

Implementing the proposed power plant component without the direct-use application component would result in the same impacts to surface water as discussed above for implementing both components. Impacts to the surface water features and flows would be temporary and minor.

Implementing the direct-use application alone would result in the same impacts to surface water as discussed above for implementing both components. Impacts to the surface water features and flows would be temporary and minor.

Groundwater Hydrology. The AmeriCulture facilities currently use 50 gpm (190 lpm) of freshwater piped from a well located 8,500 ft (2,600 m) to the west (see Figure 2-2). The wastewater from the hatchery is discharged to a containment pond west of the hatchery buildings. The amount of freshwater flowing through the hatchery would not change under the Proposed Action.

The cooling towers for the proposed power plant would require up to 100 gpm (approximately 380 lpm) of fresh water to cool the working fluid for the turbine. The amount of water used would vary in accordance with seasonal temperatures. In order to supply this increased demand, a second freshwater well would be drilled just east of the existing freshwater well. A new pipeline would be constructed adjacent to the existing pipeline in the existing easement. The existing pipeline would remain in use. The total use of freshwater with the operation of the hatchery and the proposed power plant and cooling towers would be 150 gpm (570 lpm). Since the water rights in the Animas Valley were set at a level that would be sustainable with minimal impact to the aquifer, and since the water use in the valley has declined substantially since the water rights were set, the current withdrawal of groundwater in the region has a negligible effect on the aquifer. The Proposed Action is within AmeriCulture's water rights. The withdrawal of the amount of water planned for the Proposed Action would have negligible impact on the aquifer. The water used in the cooling towers would be blended with the spent geothermal fluid and piped northwest for reinjection.

Implementing the proposed power plant component without the direct-use application component would result in the same impacts to groundwater hydrology as discussed above for implementing both components. The new freshwater well would be constructed, and same amount of freshwater would be used. The withdrawal of the amount of water planned for the power plant component would have negligible impact on the aquifer.

Implementing the direct-use application alone would result in less impact to groundwater hydrology as discussed above for implementing both components. Since the cooling tower would not be built, there would be no increase in freshwater use. While the second freshwater well would still be drilled, it would be constructed more for reliability considerations. The level of freshwater use would remain the same as the current level.

4.2.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. The approximately 100 gpm (approximately 380 lpm) of additional freshwater required for the Proposed Action would not be used. There would be no changes in the surface and groundwater hydrology as a result of Federal funding. Hatchery activities would be expected to continue as they do presently. The water use at the AmeriCulture hatchery would remain at the current level of 50 gpm (190 lpm). AmeriCulture would continue to use the current freshwater well.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. Future facility expansion could occur with the potential for impacts to surface and groundwater hydrology. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.3 CLIMATE/AIR RESOURCES

4.3.1 Proposed Action

The air quality would be slightly affected by the Proposed Action. Exhaust emissions would increase temporarily during construction. The operations of the power plant would involve intermittent emissions of ammonia from the turbines. In addition, some ammonia emissions would occur during deliveries of ammonia to fill the holding tank.

The amount of ammonia to be emitted would be calculated during the preparation of the detailed design for the plant. The plant would be designed so that the emissions would be less than the thresholds above which an operating permit would be required. These thresholds are 1.20 lbs/hr (0.54 kg/hr) at 0 ft (0 m) to less than 32.8 ft (10 m) release height, or 6.00 lbs/hr (2.7 kg/hr) at 32.8 ft (10 m) to less than 65.6 ft (20 m) release height. If the design should reveal that more than 1.20 lbs/hr (0.54 kg/hr) would be released, the stack height would be increased to 32.8 ft (10 m).

It is possible that the reinjection well would have occasional minor releases of gasses associated with the geothermal fluid. These gasses could include sulfur dioxide or carbon dioxide. The small amounts of these emissions are not regarded by the State of New Mexico as requiring permits. Any releases would be downwind of any nearby receptors.

Implementing the proposed power plant component without the direct-use application component would result in the same level of impacts to climate and air resources as discussed above for implementing both components. The ammonia emissions and possible emissions from the reinjection well would be the same. The air quality would only be slightly affected by implementing the power plant component.

Implementing just the direct-use application would have less impact to air quality than implementing the power plant component. The direct-use application would not involve emissions of ammonia. However occasional minor releases of gasses at the reinjection well associated with the geothermal fluid could still occur. Due to the use of less geothermal fluid by the direct-use application, the amount of these reinjection well emissions would be less than that associated with the power plant component. The air quality would only be slightly affected by implementing the power plant component.

4.3.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. Intermittent releases of small amounts of ammonia, sulfur dioxide, and carbon dioxide associated with the Proposed Action would not occur. There would be no changes in the impacts to air quality as a result of Federal funding. Hatchery activities would be expected to continue as they do presently.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. Future facility expansion could occur with the potential for impacts to air quality. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.4 BIOLOGICAL RESOURCES

4.4.1 Proposed Action

Based on the Proposed Action described in Chapter 2 and the conditions observed in Chapter 3, impacts to biological resources would be minor and not expected to adversely affect any plant or animal populations or communities. No impacts are projected for any individual or population of state- or federally-listed threatened or endangered plant or animal species.

Vegetation. Up to 9.3 acres (3.8 ha) of land at the site would be disturbed by Proposed Action-related tasks. The construction of the new freshwater well, the new freshwater pipeline, and the proposed power plant would all take place on approximately 6.6 acres (2.67 ha) of previously disturbed land. The new spent geothermal fluid pipeline and reinjection well would involve disturbing 2.7 acres (1.1 ha) of land that have been disturbed only by grazing activities. The new spent geothermal pipeline would not be buried. It would be supported on posts or blocks above ground to allow for expansion of the pipe. This would result in less intensive disturbance along the path of the pipeline than those associated with burial. Some loss of vegetation would result from construction related activities. All of the plant species observed (e.g., creosotebush, fourwing saltbush, purple prickly pear, and honey mesquite) are common throughout a wide geographic region and plant populations would not be adversely affected by the Proposed Action.

Implementing the proposed power plant component without the direct-use application component would result in the same impacts as those discussed above for the Proposed Action. Up to 9.3 acres (3.8 ha) of land would be disturbed, 2.7 acres (1.1 ha) of which is land that has only been previously disturbed by grazing activities. Some loss of vegetation would result from construction related activities. No impacts are projected for plant species.

Implementing just the direct-use application component would result in disturbance of 8.7 acres (3.2 ha) of land would be disturbed, 2.7 acres (1.1 ha) of which is land that has only been previously disturbed by grazing activities. The 0.6 acres (approximately 0.2 ha) of previously disturbed land where the proposed power plant would have been located would not be disturbed for the direct-use application. Some loss of vegetation would result from construction related activities. No impacts are projected for plant species.

Wetlands. A second freshwater pipeline would be required for the project. If constructed, it would avoid the marshy area on the periphery of the containment pond and thus eliminate adverse impacts to this area. The pond does not drain into waters of the United States and has not been designated a jurisdictional wetland. It does not appear to be under U.S. Army Corps of Engineers jurisdiction as a result of the U.S. Supreme Court findings in the case of *Solid Waste Agency of Northern Cook County* (SWANCC) *v. U.S. Army Corps of Engineers* (No. 99-1178) (http://originalintent.phc.edu/Library/99-1178_S.asp, (Pratt 2002)). In the SWANCC case, the U.S. Supreme Court determined that isolated wetlands are exempt from U.S. Army Corps of Engineers oversight. No impacts to the marshy area are anticipated.

Implementing the proposed power plant component alone would result in the same level of impacts to the marshy area as discussed above for implementing both components. No impacts to the marshy area are anticipated.

Implementing just the direct-use application would also result in the same level of impacts to the marshy area as discussed above for implementing both components. No impacts to the marshy area are anticipated.

Wildlife. It is anticipated that the Proposed Action would not have an adverse impact on wildlife populations. Individuals of small, or less mobile, animal species tend to hide rather than flee during threat situations. Although some individuals of a given animal species may be killed during the proposed construction activities, no adverse impacts on the population of that species is anticipated due to the presence of other members of the species that would avoid disturbance areas or be present in the abundant surrounding habitat. Most wildlife species would be expected to avoid adverse impacts by movement out of disturbance areas until construction activities have been completed. No impacts to wildlife are anticipated to result from operations from the Proposed Action.

Implementing the proposed power plant component without the direct-use application component would result in the same level of disturbance as discussed above for implementing both components. The 2.7 acres (1.1 ha) of land where the new spent geothermal fluid pipeline and reinjection well would be constructed would result in impacts to wildlife living in this area that are unable to flee as described above.

Implementing just the direct-use application would result in no disturbance of the 0.6 acres (approximately 0.2 ha) of previously disturbed land where the proposed power plant would have been located, therefore no wildlife would be affected in this area. The 2.7 acres (1.1 ha) of land where the new spent geothermal fluid pipeline and reinjection well would be constructed would result in impacts to wildlife living in this area that are unable to flee as described above.

Protected and Sensitive Species. Most of the construction activities (new freshwater well, new freshwater pipeline, and proposed power plant) would occur in previously disturbed areas characterized by parking lots, buildings, and bare ground. The reinjection well and associated pipeline construction would occur in habitat suitable for, although of marginal or low quality, for 1 state-listed plant, 2 state-listed amphibia, 1 state-listed snake, 3 state-listed birds. No state or federally protected species were observed during the pedestrian survey. Therefore, no impacts to these species are anticipated from the Proposed Action.

Implementing the proposed power plant component alone would result in the same level of disturbance to protected and sensitive species as discussed above for implementing both components. No impacts to protected or sensitive species are anticipated.

Implementing just the direct-use application would result in less disturbance than for the power plant component. The 0.6 acres (approximately 0.2 ha) of previously disturbed land where the proposed power plant would have been located would not be disturbed by the direct-use application component. No impacts to protected or sensitive species are anticipated.

4.4.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. The disturbance of approximately 9.3 acres (3.8 ha) of previously disturbed land associated with the Proposed Action would not occur. Hatchery activities would be expected to continue as they do presently. There would be no changes anticipated and therefore no potential for impacts to vegetation, wetlands, wildlife, or protected or sensitive species.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.5 CULTURAL RESOURCES

4.5.1 Proposed Action

Potential impacts to historic properties are assessed by applying the Criteria of Adverse Effect as defined in 36 CFR 800.5a. "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action

that may occur later in time, be farther removed in distance, or be cumulative." The Criteria of Adverse Effect provide a general framework for identifying and determining the context and intensity of potential impacts to other categories of cultural resources, as well, if these are present. Assessment of effects involving Native American or other traditional community, cultural or religious practices or resources requires focused consultation with the affected group.

The area of potential effect for the proposed power plant, injection well, pipelines and related facilities would be limited to the surveyed areas, much of which have been disturbed by prior activities. No historic properties or other significant cultural resources are present. The project would not disturb LA 88047; the nearest recorded archaeological site to the project area. There are no historic buildings and no known Native American or other cultural sites on or near the proposed project area which could be impacted directly or through an alteration of setting by the project. The Proposed Action would have no effect on any known cultural resources, although there does remain the remote possibility that subsurface archaeological resources could be encountered during construction excavations.

Implementing the proposed power plant component alone would result in the same level of disturbance as discussed above for implementing both components therefore, no effect on any known cultural resources are anticipated in the event that only the power plant is constructed. There does remain the remote possibility that subsurface archaeological resources could be encountered during construction excavations.

Implementing just the direct-use application would also result in slightly lesser amount of disturbance than discussed above for implementing both components, therefore, no effect on any known cultural resources are anticipated in the event that only the direct-use application is constructed. There does remain the remote possibility that subsurface archaeological resources could be encountered during construction excavations.

4.5.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. The disturbance of approximately 9.3 acres (3.8 ha) of previously disturbed land associated with the Proposed Action would not occur. Hatchery activities would be expected to continue as they do presently. There would be no effect on any known cultural resources.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.6 INFRASTRUCTURE

4.6.1 Proposed Action

The Proposed Action would involve a 200 percent increase in the use of freshwater by AmeriCulture. The current level of use for the hatchery operations and employee use is around 50 gpm (190 lpm). The cooling unit for the proposed power plant would require an additional 100 gpm (380 lpm) of freshwater. This increase would be supplied from an additional freshwater well drilled approximately 8,650 ft (2,640 m) to the west. This increase is within AmeriCulture's water rights. The water rights in the region have been set at a level that would result in minimal impact to the aquifer.

The wastewater from the AmeriCulture operations that is discharged to the containment pond would not change in quantity or character. Since the power plant would not require additional employees, the sanitary discharge would not change either. The wastewater from the power plant cooling tower skid would be blended with the spent geothermal fluid and piped to the reinjection well.

The inexpensive electrical power generated by the proposed power plant would be sold to AmeriCulture, Inc. by the generating entity (see Section 2.3.1). The use of the more expensive power from Columbus Electric (the local utility) consumed by AmeriCulture would be reduced to zero. While the power generated by the proposed power plant would be in excess of AmeriCulture's current power needs, AmeriCulture anticipates that implementation of their current expansion plans would result in their utilizing all of the power generated.

Until these plans are implemented, the generating entity could sell any excess power to Columbus Electric, if power surpluses, utility regulations, and economic considerations permit. The costs for any required safety, switching, transformer, or quality of service equipment and the amount of time between the capability to generate the power and the time AmeriCulture would need all of the generated power will affect the decision on whether to sell power to Columbus Electric. While the types and specifications of the needed equipment have not been detailed, any equipment that would be needed would be located next to the proposed power plant, just to the west of the turbines.

The power lines connected to the AmeriCulture site may not need any upgrades to accommodate the transmission of the generated power, should any be sold to Columbus Electric. Should upgrades to the existing power lines be needed, the upgrades could include replacement of the existing lines or addition of a new line. It is anticipated that the replacement line or additional line would be strung on the existing poles. The impacts of upgrading the lines on the exiting poles would be minor.

Implementing the proposed power plant component alone would result in the same level of impacts to infrastructure as discussed above for implementing both components. The additional 100 gpm (380 lpm) of freshwater would still be required for the cooling towers. The power generation and sale issues would be the same as discussed above.

Implementing just the direct-use application would result in no need for AmeriCulture to withdraw an additional 100 gpm (380 lpm) of freshwater. The withdrawal of freshwater would remain at 50 gpm (190 lpm). There would be no generation of electrical power. AmeriCulture would continue to use power from the local supplier. The potential upgrades for interconnection with Columbus Electric would not be necessary. Therefore, there would be no changes in infrastructure at AmeriCulture and no changes in infrastructure impacts.

4.6.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. Hatchery activities would be expected to continue as they do presently. AmeriCulture would continue to use power from the local supplier. There would be no changes in infrastructure at AmeriCulture and no changes in infrastructure impacts.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.7 ACOUSTIC NOISE

4.7.1 Proposed Action

The prediction of the noise effects of the Proposed Action includes those generated during construction and normal facility operation over the existing background noise. Other than workers at AmeriCulture, the primary receptor for noise would be the neighboring residence. There would be short-term noise from the construction activities. These would exceed the background noise levels in the area and would be noticeable at the residence. However, this noise would be temporary and the overall impact would be minor.

The turbine and cooling fans at the proposed power plant would be the largest source of long-term noise. The nearest offsite human receptor (person who would hear the noise) would be approximately 375 ft (114 m) from the turbines. Turbines and cooling tower fans can generate as much as 85 dB of noise at 3 to 5 ft (1 to 2 m) from the turbines (Exergy 2002). Workers at AmeriCulture would experience an increase in noise from around 60 dBA, to noise levels as high as 75 to 85 dBA, equivalent to the level of a noisy urban daytime environment. The neighboring residence could experience noise levels as high as 70 to 80 dBA. This receptor would also experience the rise in noise to an equivalent of a noisy urban daytime environment.

The determination as to whether an impact is significant with respect to noise is a qualitative assessment of the increase in noise level above background as experienced by those receptors near the source. A subjective response to changes in sound levels based upon judgements of sound presented within a short timespan indicate that a change of +/- 5 dBA may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be "barely perceptible." Changes in sound levels of +/- 10 dBA within a short

timespan may be perceived as "dramatic" and changes in sound levels of +/- 20 dBA within a short timespan may be perceived as "striking". A qualitative assessment of dramatic and striking changes in sound level could be considered a significant impact.

While the noise from the turbine would not be short-term, and thus, the "noticeability" would be slightly reduced, the one nearby human receptor, which is at the residence that is approximately 375 ft (114 m) from the turbines, is likely to experience the increase in noise from around 50 dBA to around 75 dBA as "dramatic" or "striking". However, the noise would not be of a new type. The Burgett turbine power generator to the southeast already produces similar noise.

Implementing the proposed power plant component without the direct-use application component would result in the same level of noise impacts as discussed above for implementing both components. The neighboring residence could experience noise levels as high as 70 to 80 dBA.

If just the direct-use application were to be implemented, the turbine generator and cooling tower fans would not be built and would not be a source of noise. The direct-use application does not involve any large sources of noise. The noise level of current operations (around 60 dBA) would continue but would not increase. The noise level from AmeriCulture hatchery and Burgett greenhouse operations would remain at about 50 dBA at the nearby residence.

4.7.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. Hatchery activities would be expected to continue as they do presently. The current level of noise (around 60dBA) would continue. The noise level from AmeriCulture hatchery and Burgett greenhouse operations would remain at about 50 dBA at the nearby residence. There would be no changes in noise impacts from AmeriCulture operations.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.8 VISUAL RESOURCES

4.8.1 Proposed Action

The existing visual resources were discussed from two viewpoints, the neighboring residence and NM 338. The visual impacts of the proposed power plant facilities from the neighboring residence would include direct sight of the turbine generator and cooling tower skids in the foreground, as well as the steam plume in the foreground and midground. With a possible height of 33 ft (10 m) the stack would be the most visible equipment. The cooling towers at 25 ft (7.6 m) would also be visible. While there is an existing steam plume from the Burgett geothermal operations, the AmeriCulture steam plume would be closer, and therefore, more visible.

From the viewpoint of NM 338, the impacts to the mid-ground view of the proposed facilities would not be much of an addition to the impacts from the existing facilities. The addition of a second steam plume close to the first one would result in very minor impact to visual resources from this viewpoint.

Implementing the proposed power plant component alone would still include the turbine generator, stack, and cooling towers. The second steam plume would still be produced. The same level of impacts to visual resources would occur as discussed above for implementing both components.

Implementing just the direct-use application would not include the turbine generator, stack, or cooling towers. The second steam plume would not be produced. Also, the temporary visual resource impacts associated with construction dust would be reduced. The visual impacts would be the same as for current operations.

4.8.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. Hatchery activities would be expected to continue as they do presently. The power plant stack and cooling towers associated would not be built. There would be no additional facilities added to the visual foreground at AmeriCulture. There would be no second steam plume. Only the current steam plume from the Burgett greenhouse operations would be visible. There would be no changes in impacts to visual resources.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.9 LAND USE

4.9.1 Proposed Action

The current land use around the AmeriCulture site is a mix of grazing, commercial/light industrial, and residential. Regardless of whether both components of the Proposed Action (the power plant and direct-use application) are built, just the power plant component, or just the direct-use application component, the site would still be used for commercial/industrial purposes. The land use in the surrounding area would not change in any of these cases. Therefore, the construction of the power plant or the direct-use application would not affect land use in the AmeriCulture area.

4.9.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use

application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. Hatchery activities would be expected to continue as they do presently. No change in land use would occur

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects as discussed above would not involve a change in land use.

4.10 Socioeconomic Resources

4.10.1 Proposed Action

Potential impacts to socioeconomic resources are assessed by determining whether the action would substantially alter the location and distribution of populations, change populations at a rate that exceeds historic rates, decrease jobs so as to raise the regional unemployment rates or reduce income generation, substantially affect the local housing market, preclude the use of resources for other economically viable enterprises, result in the need to construct new schools or medical facilities or would affect the delivery of emergency and other community services.

The Federal involvement in partial funding of the proposed power plant, injection well, pipelines and related facilities would not result in any major socioeconomic changes. AmeriCulture is a family-run enterprise that currently has one regular outside employee, although additional temporary workers are sometimes used (Seawright 2002). Some temporary employment and additional goods and services from local vendors could be required during construction, but these minor inputs into the local economy would be temporary. Operation of the new facilities, as proposed, would not require permanent additions to the current workforce. The Proposed Action would therefore have little or no direct effect on population, demographics, employment, or availability of housing or community services. The geothermal resource in the area can support a limited amount of electrical generation or other uses near the source, but not a large-scale generation project. This action would not impact other viable uses of the resource in the area.

AmeriCulture has future plans to expand the aquaculture operations at the site. The timing and nature of any expansion would be dependent on permitting, the availability of water rights, the price of power, product markets, and other economic factors. To the extent that these factors can be projected, the Proposed Action may affect the timing and economic viability of these plans by, for example, lowering power costs or freeing other capital for the expansion. These expansion plans are not dependent on the Proposed Action. There could be substantial socioeconomic effects if a large expansion is undertaken, but these plans are not ripe for analysis here.

Implementing the proposed power plant component alone would result in the same level of impacts to socioeconomic resources as discussed above for implementing both components. Operation of the proposed power plant would not require permanent additions to the current workforce, and therefore, would have little or no direct effect on population, demographics, employment, or availability of housing or community services.

Implementing just the direct-use application would result in less temporary and minor involvement in the local economy for construction and materials than as described for the Proposed Action as a whole. Operation of the direct-use application would not require permanent additions to the current workforce, and therefore, would have little or no direct effect on population, demographics, employment, or availability of housing or community services.

4.10.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. Hatchery activities would be expected to continue as they do presently. No change in the current workforce, and therefore, no direct effect on population, demographics, employment, or availability of housing or community services would occur.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.

4.11 ENVIRONMENTAL JUSTICE

4.11.1 Proposed Action

Environmental justice impacts occur if there are any disproportionately high and adverse human health or environmental effects on minority or low-income populations.

No significant impacts are expected from the Proposed Action or if either component were to be implemented alone. Therefore, no disproportionately high and adverse human health or environmental effects would be anticipated to the minority or low-income populations in the project study area.

4.11.2 No Action Alternative

Under the No Action Alternative, DOE would not provide funds for either the proposed power plant or the direct-use application. Neither the proposed power plant nor the direct-use application would be built as part of a Federal Action. No changes attributed to direct Federal financial assistance under this program would occur at the AmeriCulture site. Hatchery activities would be expected to continue as they do presently. There would be no changes anticipated and therefore no potential for disproportionately high and adverse human health or environmental effects to the minority or low-income populations in the project study area.

While the partial funding from DOE would not be granted, it is possible that other sources of funding, including private funds, could be obtained by AmeriCulture to build either, or both, of these projects. In that case, the projects and their impacts could occur anyway. The timing and nature of any expansion would be dependent on financial factors and the aquaculture market.